

Introduction

Cygnus NG-11



S.S. Roger Chaffee at the Space Station

Mission type ISS resupply
Operator NASA

Spacecraft properties

Spacecraft S.S. Roger Chaffee
Spacecraft type Enhanced Cygnus
Manufacturer Northrop Grumman
 Thales Alenia Space

Start of mission

Launch date 17 April 2019, 20:46:07 UTC
Rocket Antares 230
Launch site MARS LP-0A
Contractor Northrop Grumman

Orbital parameters

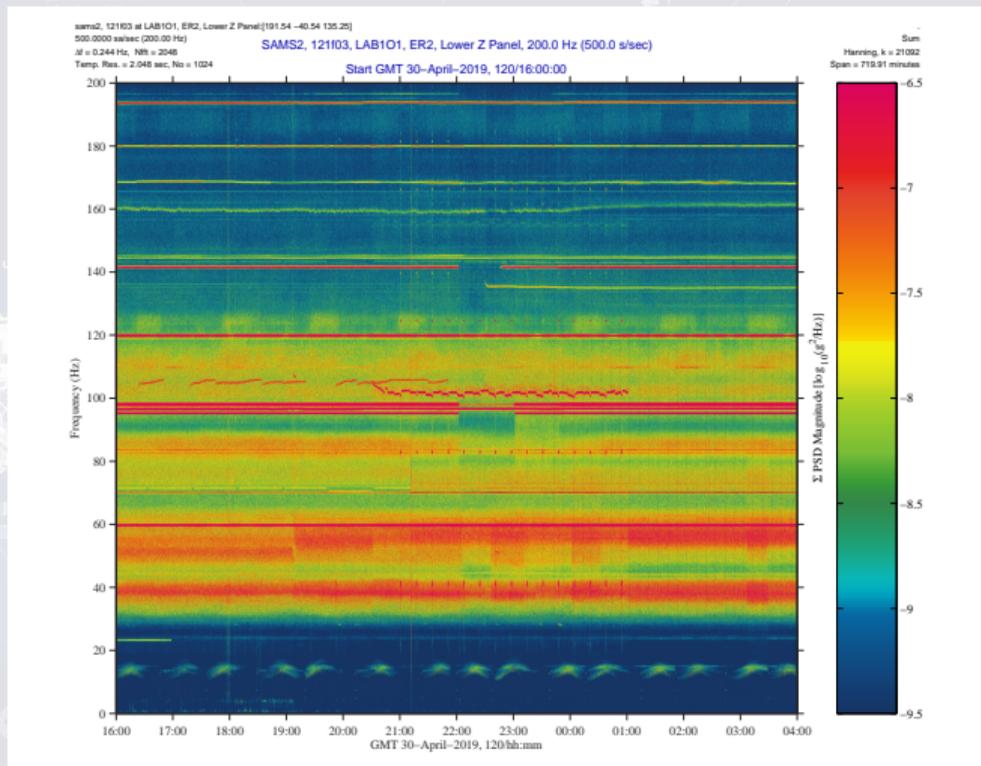
On Tuesday, GMT 2019-04-30 (Day 120), the Thermal Amine equipment, located in EXPRESS Rack 2 (LAB101) was activated and checked out, including a powercycle of the Adlink Mini-PC to get ground telemetry and successful vacuum leak checks of all 4 scrubber beds. The Thermal Amine Scrubber is an upgraded version of the Amine Swingbed and will be used as a long-term CO₂ scrubber on the International Space Station (ISS).

The Thermal Amine equipment was launched on NG-11 and provides the capability to operate the Life Support Rack (LSR), a Carbon Dioxide Removal Assembly for up to 7 crew members. This capability comes instead of continuously running two Carbon Dioxide Removal Assemblies (CDRAs).

Scrubber Noise

Reports suggest the Thermal Amine Scrubber was introducing noise into its power draw from EXPRESS Rack 2 (ER2), LAB101, around GMT 120/21:14.

This spectrogram was computed from measurements from a SAMS sensor mounted on ER2. Note the strong spectral disturbance that starts at about 20:30 at around 101.6 Hz, and strong pulse trains at about 41.7, 83.2, 124.8 and 166.3 Hz, the first one starting at about 21:00:08.

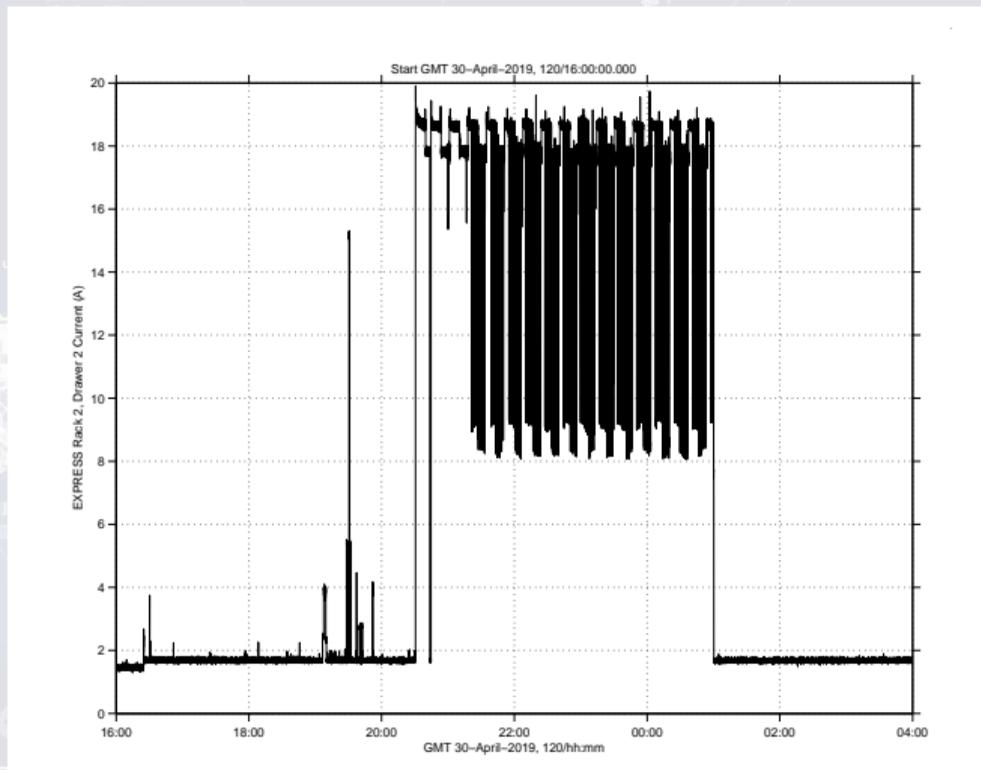


ER2, Drawer 2 Current

This figure shows a plot of current draw from drawer 2 of EXPRESS Rack 2 (ER2).

The drawer 2 current jumps about **tenfold** from under 2 A to nearly 20 A at GMT 20:30:42.

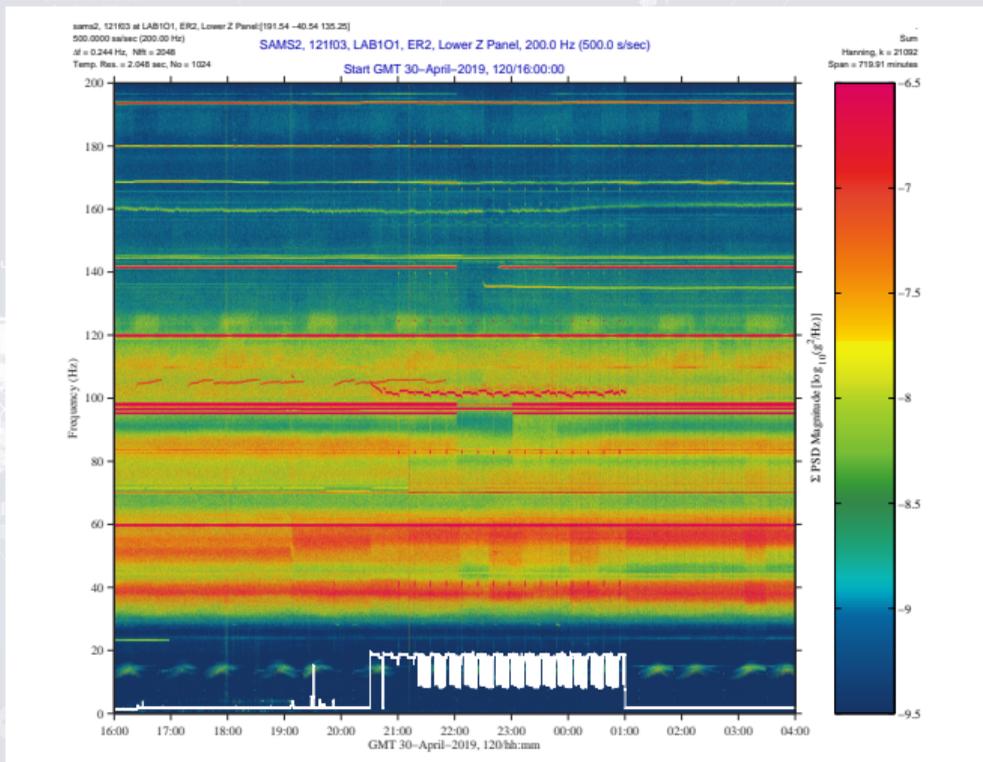
The next page will overlay this information along with the SAMS spectral data from the previous page to show a strong correlation between transitions in current and acceleration data.



Acceleration/Current Overlay

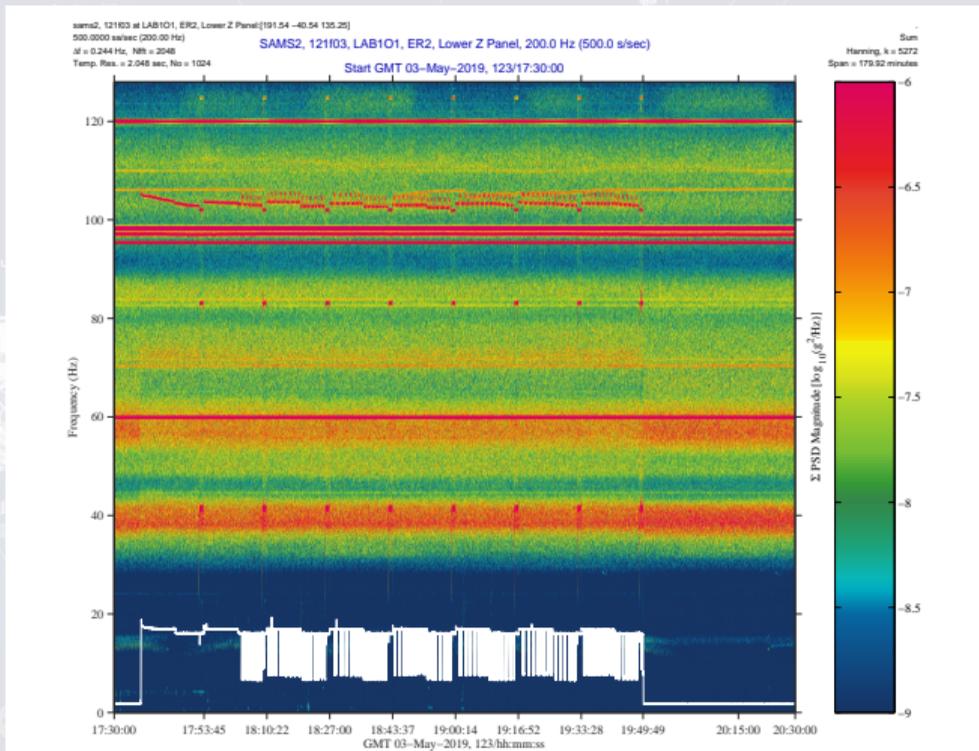
The spectrogram here was computed from measurements made by a SAMS sensor mounted on ER2. *It includes an overlay of ER2 drawer 2 current (the white trace along the bottom).*

Note the temporal alignment of the white trace (current) with the strong spectral disturbances near 41.7, 83.2, 101.6 Hz, 124.8 and 166.3 Hz. This suggests correlation between the current & vibrations or both of those to a 3rd variable that is unaccounted for here.



Similar Ops on Later Date

On GMT 2019-05-03, the Thermal Amine team attempted nominal operations again. This time with activation at about GMT 123/17:35 and deactivation later, at 123/20:05. The color spectrogram here was computed from SAMS measurements made on ER2, along with ER2 drawer 2 current as a white overlay trace. Note a strong correlation between the current associated with this payload and the vibration measurements made nearby with the SAMS.



GMT 2019-04-30 Accel. vs. Time

This 3-panel plot shows X-, Y- and Z-axis acceleration measurements versus time from the SAMS sensor mounted near the Thermal Amine equipment on GMT 2019-04-30.

Note the large, impulsive accelerations primarily aligned with the YZ-plane. These peaks top out at over 100 mg peak-to-peak on the Z-axis.

Solar Arrays
 The most visible feature on the space station. There are 36 of these large panels on the ISS, and each one is over 30 meters long. They generate over 200 kW of electricity, much more power than the Golden Gate.

Retractable metal framework
 Made from carbon fiber, this structure is used to support various instruments and equipment.

FGB Zarya
 The first module launched in 1998.

Express Logistics Carrier
 Alpha Magnetic Spectrometer

Canadarm 1 Large Robot

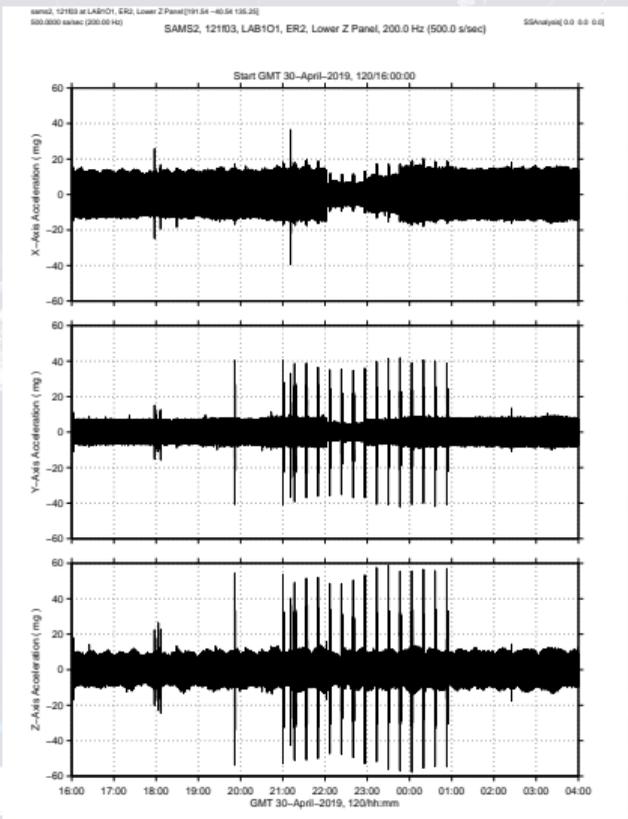
Service Module
 Progress Spacecraft

Electrical Cables
 These are used to connect various systems on the station.

Panel

Module

The International Space Station (ISS) is the largest man-made object in orbit. It is a complex of modules, solar arrays, and other equipment. The station is a collaboration of many countries, including the United States, Russia, Canada, Europe, and Japan. The station is used for scientific research, technology development, and engineering. It is also a platform for international cooperation and education.



GMT 2019-05-03 Accel. vs. Time

This 3-panel plot shows X-, Y- and Z-axis acceleration measurements versus time from the SAMS sensor mounted near the Thermal Amine equipment on GMT 2019-05-03.

Note the large, impulsive accelerations primarily aligned with the YZ-plane. These peaks top out at nearly 120 mg peak-to-peak on the Z-axis.

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Retractable metal framework
 Made from
 Carbon fiber tubes

FGB Zarya
 First module launched in 1998

Express Logistics Carrier
 Alpha Magnetic Spectrometer

Canadarm 1 Large Robot

Soyuz Spacecraft
 Carries crew and cargo to the space station

Progress Spacecraft
 Arrives regularly to the space station to deliver cargo

Electrical Cables
 There are over 100,000 of these cables on the ISS.

Paola

Module

The International Space Station (ISS) is the largest man-made object in low Earth orbit. It is a complex of modules, solar arrays, and other equipment that orbit the Earth at an altitude of approximately 400 kilometers. The station is a collaborative project of several countries, including the United States, Russia, Europe, Japan, and Canada. It is used for scientific research, technology development, and engineering studies in space. The International Space Station is the only human-made structure in space that is continuously occupied by humans. It is a testament to human ingenuity and the power of international cooperation in space exploration.

